Unit 1 - Day 15L - Algebraic and Geometric Proofs

Agenda

- Go over HW 1.13 and 1.14
- Notes - 1.15 - NEED TOOL POUCH

IN NOTES — WORKSHEET

HW -

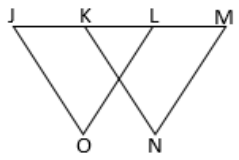
Problem Set Proof Packet- 1.15

Problem Set 2-2R/2-3L

For questions 1-4, identify the property being used:

1. If AB = CD and CD = EF, then AB=EF. _____
2. If AB = CD and EF = CD, then AB=EF. _____
3. $\measuredangle TRY \cong \measuredangle TRY$ _____
4. If $m\measuredangle 1 = m\measuredangle 2$ and $m\measuredangle 3 = m\measuredangle 3$ then $m\measuredangle 1 + m\measuredangle 3 = m\measuredangle 2 + m\measuredangle 3$. _____

For questions 5-8, complete the following proofs:



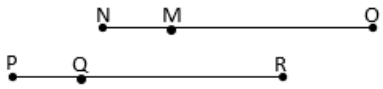
5. Given: $\measuredangle J \cong \measuredangle OLJ; \measuredangle OLJ \cong \measuredangle M$

   Prove: $\measuredangle J \cong \measuredangle M$

Statements	Reasons
1. $\measuredangle J \cong \measuredangle OLJ$	1.
2. $\measuredangle OLJ \cong \measuredangle M$	2.
3. $\measuredangle J \cong \measuredangle M$	3.

6. **Given:** $\overline{NMQ}, \overline{PQR}, NO = PR, NM = PQ$

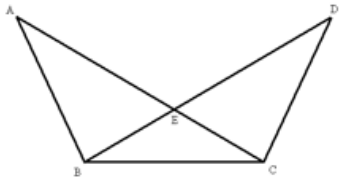
Prove: $MO = QR$



Statements	Reasons
1. $\overline{NMQ}, \overline{PQR}, NO = PR$	1.
2. $NM + MO = NO; PQ + QR = PR$	2.
3. $NM + MO = PQ + QR$	3.
4. $NM = PQ$	4.
5. $MO = QR$	5.

7. **Given:** $m\angle ABD = m\angle DCA; m\angle DBC = m\angle ACB$

Prove: $\angle ABC \cong \angle DCB$

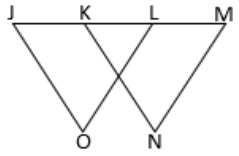


Statements	Reasons
1.	1. Given
2. $m\angle ABD + m\angle DBC = m\angle DCA + m\angle ACB$	2.
3.	3. Angle Addition Postulate
4. $m\angle ABC = m\angle DCB$	4.
5.	5.

8. **Given:** $\overline{JK} \cong \overline{ML}$

Prove: $\overline{JL} \cong \overline{MK}$

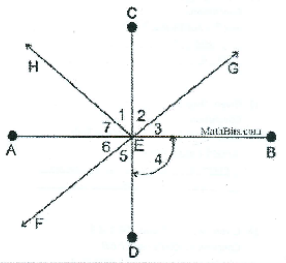
(Hint: how is this really just a segment problem?)



Statements	Reasons

Geometry LAB Name KEY Due: _____ Section: _____
Worksheet 2-2L

Use the diagram for all questions and your axioms page to help you find the reasons. Each problem is independent of any previous given information.



1. Given: $\overline{CD} \perp \overline{AB}$
Conclusion: $\angle CEB$ right $\angle$
Reason: DEFINITION OF PERPENDICULAR LINES

2. Given: $m\angle 2 + m\angle 3 = 90$
Conclusion: $\angle 2$ and $\angle 3$ complementary
Reason: DEFN OF COMPLEMENTARY ANGLES

3. Given: E is midpoint of $\overline{AB}$
Conclusion: $\overline{AE} \cong \overline{BE}$
Reason: DEFN OF A MIDPOINT

4. Given: $\angle 2 \cong \angle 3$ (NOT $\angle$S FORM A LINEAR PAIR)
Conclusion: $\overline{EC}$ bisects $\angle CEB$
Reason: DEFN OF AN ANGLE BISECTOR

5. Given: $\angle AEC$ and $\angle 5$ supplementary
Conclusion: MEASURE $\angle AEC + m\angle 5 = 180°$
Reason: DEFN OF SUPPLEMENTARY $\angle$'S

6. Given: $\overline{EH}$ bisects $\angle AEC$
Conclusion: $\angle 1 \cong \angle 7$
Reason: DEFN OF AN ANGLE BISECTOR

7. Given: $\angle 3$ and $\angle 6$ vertical $\angle$s
Conclusion: $\angle 3 \cong \angle 6$
Reason: VERTICAL $\angle$S FORM CONGRUENT

8. Given: linear pair $\angle AFG$ and $\angle GEB$
Conclusion: $\angle AFG$ SUPP $\angle$ EBB
Reason: LINEAR PAIR → SUPPLEMENTARY $\angle$S

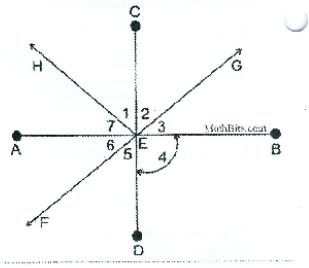
9. Given: diagram
Conclusion: $m\angle 4 + m\angle 3 = m\angle DEG$
Reason: ANGLE ADDITION POSTULATE

10. Given: $m\angle 5 = m\angle 6$
Conclusion: $\angle 5 \cong \angle 6$
Reason: DEFN OF CONGRUENCY

11. Given: $\angle 4$ right $\angle$
Conclusion: $m\angle 4 = 90°$
Reason: DEFN OF A RIGHT ANGLE

12. Given: Diagram
Conclusion:
$m\angle 7 + m\angle 1 + m\angle 2 + m\angle 3 = 180°$
CONGRUENT ANGLES ON A LINE SUM TO 180°

13. Given: Diagram
Conclusion:
$m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 + m\angle 6 + m\angle 7 = 360°$
ANGLES AT A POINT SUM TO 360°



14. Given: $\angle 3 \cong \angle 5$ and $\angle 4 \cong \angle 4$
Conclusion: $\angle GED \cong \angle FEB$
OVERLAPPING / COMMON ANGLE THEOREM

15. Given: $\angle HEF \cong \angle DEA$ and $\angle 6 \cong \angle 6$
Conclusion: $\angle 7 \cong \angle 5$ OVERLAPPING / COMMON $\angle$ THEOREM

16. Given: $\angle BED$ & $\angle HEF$ are right angles
Conclusion: $\angle BED \cong \angle HEF$
RIGHT $\angle$'S ARE CONGRUENT

17. Given: $\angle 1$ complementary to $\angle 7$
$\angle 6$ complementary to $\angle 7$
Conclusion: $\angle 1 \cong \angle 6$
CONGRUENT COMPLEMENTS THEOREM

$\angle 7$ complementary to $\angle 7$

18. Given: $\angle 2$ complementary to $\angle 3$
$\angle 3 \cong \angle 7$
Conclusion: $\angle 1 \cong \angle 2$
CONGRUENT COMPLEMENTS THEOREM

19. If $\angle CEA$ and $\angle CEB$ are bisected by $\overleftrightarrow{EH}$ & $\overline{EG}$, respectively, then: $\angle 7 \cong \angle 1$ and $\angle 2 \cong \angle 3$
because DEFN OF ANGLE BISECTOR
If $\angle CEA \cong \angle CEB$ as well, then $\angle 7 \cong \angle 1 \cong \angle 2 \cong \angle 3$ because
MEASURES OF CONGRUENT ANGLES ARE CONGRUENT

Warm Up Quiz G

*Write this for 1)

1. The statement $\measuredangle T \cong \measuredangle T$ is an example of the _____ property. (circle your answer)

   A) Transitive B) Reflexive C) Substitution D) Biconditional

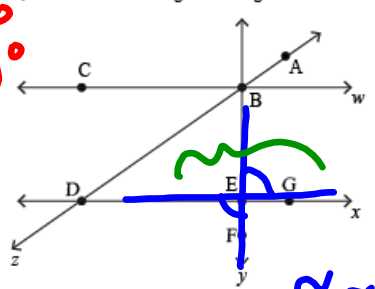
2. Draw or describe a counterexample to the conditional statement, "If two angles are complementary, then each angle measures 45°."

Warm UP - Quiz

1. Given: $\angle J$ and $\angle K$ are right angles
   Conclusion: $\angle J \cong \angle K$ $m\angle J = 90°$ $m\angle K = 90°$
   Reason: RIGHT $\angle$'S ARE $\cong$ $\angle$RT $\angle$ MEASURES 90°

2. Given: $\angle 1$ supplementary $\angle 2$
   $\angle 1$ supplementary $\angle 3$
   Conclusion: $\angle 2 \cong \angle 3$
   Reason: CONGRUENT SUPPLEMENTS THM

For 3 & 4, use the drawing as the given



3. Conclusion: $\angle FED \cong \angle GEB$
   Reason: Vertical Angle Pairs are Congruent

4. Conclusion: $\angle BED$ & $\angle BEG$ form a linear pair
   Reason: DIAGRAM
   2 $\angle$'S ~~ADJACENT~~ & MAKING A LINE

Geometry LAB Name:_____ Date:_____ Section:_____

1-15L Notes Algebraic + Geometric Proofs (Bisectors & Halves of Congruent Figures)

Refer to your lesson summaries and axiom pages for examples of & additional reasons used in proofs

- Angle bisector $\leftrightarrow 2 \cong$ adjacent angles (definition of an angle bisector)
- Segment bisector $\leftrightarrow 2 \cong$ adjacent collinear segments (definition of a segment bisector)
- Midpoint $\leftrightarrow 2 \cong$ adjacent collinear segments (definition of a midpoint)
- Also: segment bisector $\leftrightarrow$ midpoint of the segment
- Halves of Congruent Angles are Congruent / Halves of Congruent Segments are Congruent
- *Angle Addition Postulate/Segment Addition Postulate*
- *Reflexive, Transitive, Properties, Algebraic Properties & Substitution*

EX 1: Given Bisectors

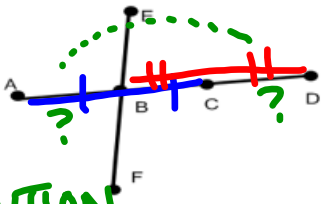
Given: $\overline{EF}$ bisects $\overline{AC}$ at B; $\overline{ABCD}$
C is the midpoint of $\overline{BD}$

Prove: $\overline{AB} \cong \overline{CD}$

2 ≅ HALVES

2 ≅ HALVES

TRANSITIVE / SUBSTITUTION



Statements	Reasons
1. $\overline{EF}$ BISECTS $\overline{AC}$ AT B, $\overline{ABCD}$	1. GIVEN
2. $\overline{AB} \cong \overline{BC}$	2. BISECTOR → 2 ≅ HALVES
3. C IS THE MIDPOINT OF $\overline{BD}$	3. GIVEN
4. $\overline{BC} \cong \overline{CD}$	4. MIDPOINT → 2 ≅ HALVES
5. $\overline{AB} \cong \overline{CD}$	5. TRANSITIVE OR SUBSTITUTION (STEP 4 INTO 2)

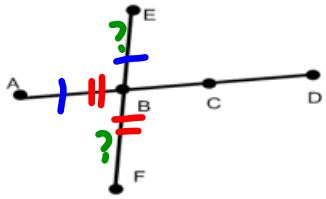
EX 2: Prove a Bisector

Given: $\overline{BE} \cong \overline{AB}; \overline{AB} \cong \overline{BF}, \overline{EBF}$ ✓

Prove: B is the midpoint of $\overline{EF}$

EB ≅ BF

EBF ✓

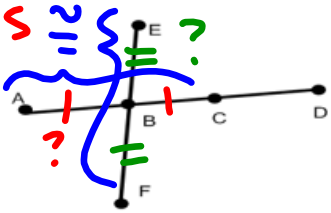


Statements	Reasons
1. BE ≅ AB; AB ≅ BF; EBF	1. GIVEN
2. BE ≅ BF	2. SUBSTITUTION (STEP 1 INTO 1)
3. B IS THE MIDPOINT OF $\overline{EF}$	3. MIDPOINT ↔ 2 ≅ COLLINEAR SEGMENTS

EX 3: Halves of Congruent Figures

Given: $\overline{AC} \cong \overline{EF}, \overline{ABC}, \overline{EBF}$; B bisects $\overline{AC}$ and $\overline{EF}$

Prove: $\overline{AB} \cong \overline{EB}$



2 ≅ HALVES ≅

Statements	Reasons
1. B BISECTS $\overline{AC}$, $\overline{ABC}$	1. GIVEN
2. $\overline{AB} \cong \overline{BC}$	2. BISECTOR → 2 ≅ HALVES
3. B BISECTS $\overline{EF}$, $\overline{EBF}$	3. GIVEN
4. $\overline{BE} \cong \overline{BF}$	4. BISECTOR → 2 ≅ SEGMENTS
5. $\overline{AC} \cong \overline{EF}$	5. GIVEN
6. $\overline{AB} \cong \overline{EB}$	6. HALVES OF ≅ SEGMENTS ARE ≅

HALVES OF ≅ SEG ARE ≅

HALVES OF ≅ ∠'S ARE ≅

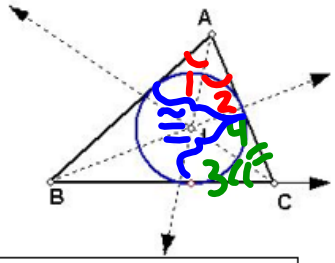
EX 4: Halves of Congruent Figures

2 ≅ HALVES

Given: $\overline{AI}$ bisects $\angle BAC$; $\overline{CI}$ bisects $\angle BCA$; $\angle BAC \cong \angle BCA$

Prove: $\angle IAC \cong \angle ICA$

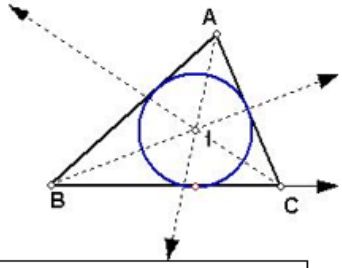
∠2 ∠4



Statements	Reasons
1. $\overrightarrow{AI}$ BISECTS ∠BAC, $\overrightarrow{CI}$ BISECTS ∠BCA	1. GIVEN
2. ∠1 ≅ ∠2, ∠3 ≅ ∠4	2. BISECTOR → 2 ≅ HALVES
3. ∠BAC ≅ ∠BCA	3. GIVEN
4. ∠2 ≅ ∠4	4. HALVES OF ≅ ANGLES ARE CONGRUENT

HALVES OF ≅ ∠'S

EX 5: Halves of Congruent Figures



Given: $\measuredangle BAI \cong \measuredangle IAC \cong \measuredangle BCI \cong \measuredangle ICA$

Prove: $\measuredangle BAC \cong \measuredangle BCA$

Statements	Reasons
1.	1.
2.	2.
3.	3.